

# Stats 1 - May / June 2010

① a) From calculator:  $\sum x^2 = 158\ 358\ 90$   
 $r = 0.915644\dots$

b) Very strong, positive, linear correlation between weight and engine power

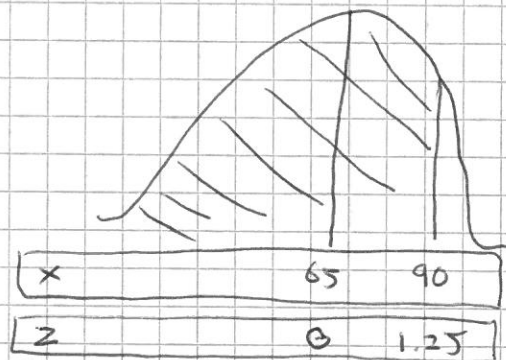
② a) i) From calculator:  $\sum x = 18$   $\sum x^2 = 1680$   
Mean ( $\bar{x}$ ) = 1.5  
Sample sd (s) = 12.258577...

ii) Mean =  $50 + 1.5 = 51.5$  p  
sd = same = 12.2585...

b) Mean =  $51.5 \times 1.22 = 62.83$  cent  
= 0.6283 EURO  
sd =  $12.258 \times 1.22 = 14.954$  cent  
= 0.1495 EURO

③  $X \sim N(65, 20^2)$

a)  $P(X < 90)$   
=  $P(Z < \frac{90-65}{20})$   
=  $P(Z < 1.25)$   
= 0.89435



ii)  $P(X > 60)$   
=  $P(Z > \frac{60-65}{20})$   
=  $P(Z > -0.25)$   
=  $1 - P(Z < -0.25)$   
= 0.59871



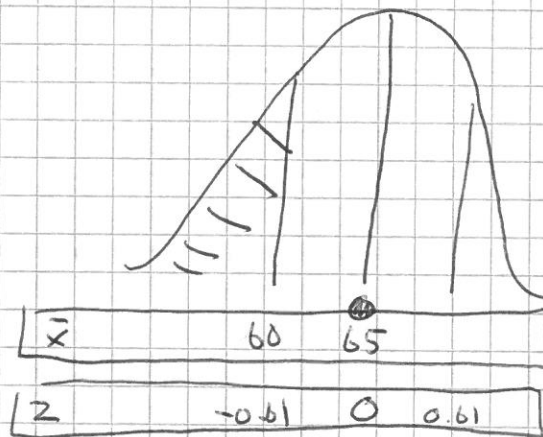
b) i) Exactly!  $P(X=60) = 0$ .

ii) From aii)  $P(X < 60) = 1 - 0.59871$   
 $= 0.40129$

Each day  $\rightarrow 0.40129^6 = 0.004175\dots$

iii)  $\bar{X} \sim N(65, 20^2/6)$

$$\begin{aligned}
 &P(\bar{X} < 60) \\
 &= P\left(Z < \frac{60 - 65}{20/\sqrt{6}}\right) \\
 &= P(Z < -0.61\dots) \\
 &= P(Z > 0.61) \\
 &= 1 - P(Z < 0.61) \\
 &= 1 - 0.72907 \\
 &= 0.27093
 \end{aligned}$$



4) a)  $M \sim B(50, 0.15)$

i)  $P(M \leq 10) = 0.8801$  (tabel)

ii)  $P(M \geq 5) = 1 - P(M \leq 4)$   
 $= 1 - 0.1121 = 0.8879$

iii)  $P(6 < M < 12)$

can be: 7, 8, ..., 11

$$\begin{aligned}
 &= P(M \leq 11) - P(M \leq 6) \\
 &= 0.9372 - 0.3613 = 0.5759
 \end{aligned}$$

b)  $F \sim B(35, 0.11)$

$$\begin{aligned}
 P(F=4) &= {}^{35}C_4 \times 0.11^4 \times 0.89^{31} \\
 &= 0.28685
 \end{aligned}$$

c) Number of makes in sample =  $0.52 \times 2000 = 1040$

Makes Mean =  $np = 1040 \times 0.15 = 156$



Number of females in sample =  $0.48 \times 2000 = 960$

Female mean =  $\mu_p = 960 \times 0.11 = 105.6$

$\therefore$  Total =  $156 + 105.6 = 261.6$

5) a) i)  $P(J, R) = 0.9 \times 0.7 = 0.63$

ii)  $P(J', R') = 0.1 \times 0.8 = 0.08$

iii)  $P(\text{at least 1}) = 1 - P(\text{no sons})$   
 $= 1 - 0.08 = 0.92$

b) i)

	M	M'	TOTAL
D	0.4	0.35	0.75
D'	0.2	0.05	0.25
TOTAL	0.6	0.4	1

ii) (A)  $P(D', M') = 0.05$

(B)  $P(D, M') = 0.35$

(C)  $P(1 \text{ cow}) = 0.35 + 0.2 = 0.55$

6) a) From calculator:  $a = 509.7169...$  (intercept)

$b = 3.2547...$  (gradient)

$\rightarrow y = 509.716 + 3.2547x$

b) i) See Mark scheme

$x = 80, y = 769$

$x = 40, y = 639$

ii) (1) There is evidence of a weak, positive linear correlation

(2) E and H are outliers

c) i) See Mark scheme.

$$c) \text{ ii) } b = \frac{S_{xy}}{S_{xx}} = \frac{14760}{1272} = 11.603$$

$$a = \bar{y} - b\bar{x}$$

$$= 720 - 11.603 \times 60 = 23.7735$$

$$\rightarrow y = 23.7735 + 11.603x$$

iii) Less residuals and outliers

More evidence of a stronger positive correlation between age and reaction time.